WHAT IS CLAIMED IS:

1. A magnetron comprising:

an anode comprising plural vanes whose one end is fixed on the inner wall of a cylindrical anode shell and their inner ends opposite to the one ends are radially extended toward the center of the anode shell, and of plural hollow confined spaces formed between adjacent ones of the plural vanes;

a cathode provided at the center of the anode; and

a pair of pole pieces arranged at both sides of side surfaces of the vanes in such a manner that a magnetic field nearly parallel to the cathode can be applied on the interaction space where the inner ends of the vanes and the cathode face with each other;

wherein at least one of the pair pole pieces is so positioned that an inner end of the pair of pole pieces is within 0.015λ from the side surfaces of the vanes in the range extending from the inner ends of the vanes to a point at least 1/3 of the vane length;

wherein λ is the oscillation wavelength of the magnetron, and said vane length is a distance from said one end to said inner end

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2. A magnetron comprising:

an anode comprising plural vanes whose one end is fixed on the inner wall of a cylindrical anode shell and their inner ends opposite to the one ends are radially extended toward the center of the anode shell, and of plural hollow confined spaces formed between adjacent

ones of the plural vanes;

a cathode provided at the center of the anode; and

a pair of pole pieces arranged at both sides of side surfaces of the vanes in such a manner that a magnetic field nearly parallel to the cathode can be applied on the interaction space where the edge parts of the vanes and the cathode face with each other;

wherein between a surface adjacent said inner ends of said at least one of the pair pole pieces and said side surfaces of said vanes, there are provided metal pieces in a position within 0.015 λ from the side surfaces of the vanes in the range extending from the inner ends of the vanes to a point at least 1/3 the vane length;

wherein λ is the oscillation wavelength of the magnetron;

wherein the vane length is a distance from said one end to said inner end.

3. A magnetron comprising:

an anode comprising plural vanes whose one end is fixed on the inner wall of a cylindrical anode shell and their inner ends opposite to the one ends are extended radially toward the center of the anode shell, and of plural hollow confined spaces formed between adjacent ones of the plural vanes;

a cathode provided at the center of the anode;

and a pair of pole pieces arranged at both sides of side surfaces of the vanes in such a manner that a magnetic field nearly parallel to the cathode can be applied on the interaction space where the inner ends of the vanes and the cathode face with each other;

wherein the inner ends of the pole pieces or the metal pieces

are arranged as opposed to the side surfaces of the vanes so that the resonance frequency of the mode resulting from the space between the side surfaces of the vanes and surfaces adjacent the inner ends of the pole pieces can be a frequency between the π mode and the π - 1 mode.

4. The magnetron of Claim 4, wherein the surfaces adjacent the inner ends of the pole pieces or the metal pieces are arranged as opposed to the side surfaces of the vanes so that the resonance frequency of the mode resulting from the space between the side surfaces of the vanes and the surface adjacent the inner ends of the pole pieces can be a frequency within 250 MHz from about the lower limit of the frequency of the π - 1 mode.